



LXI. Further remarks on the rev. Mr. Liston's "essay on perfect intonation:" and his scale with 59 notes in the octave; and on other scales (perfect and tempered) for 12, 14, 16, 17, 19, 21, 22, and 24 notes in the octave respectively, &c

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LXI. *Further Remarks on the Rev. Mr. LISTON'S "Essay on perfect Intonation:" and his Scale with 59 Notes in the Octave; and on other Scales (perfect and tempered) for 12, 14, 16, 17, 19, 21, 22, and 24 Notes in the Octave respectively, &c. By Mr. JOHN FAREY Senior.*

To Mr. Tilloch.

SIR, **I**n my last communication, respecting Mr. Liston's Euharmonic Organs at Flight's in St. Martin's Lane, two errors have escaped correction in p. 375, viz. line 9 from the bottom of the note, for 7T read 7L, and line 2 from bottom, after each, insert, ** and.

It is perhaps not generally understood, that the Douzeave or Scale of 12 notes, wherein the intervals above C are all diatonic, major and minor, has no sharpened notes, but all of the five interposed or chromatic notes, are flats (as I used to denote them, in my early papers in your Magazine), thus:

I	2	III	4	5	VI	7	VIII					
C	D ^b	D	E ^b	E	F	G ^b	G	A ^b	A	B ^b	B	c
	S	S*	S	S*	S	S	S	S	S	S	S	S
+	$\frac{1}{2}$	$\frac{2}{3}$	$\frac{3}{4}$	$\frac{4}{5}$	$\frac{5}{6}$	$\frac{6}{7}$	$\frac{7}{8}$	$\frac{8}{9}$	$\frac{9}{10}$	$\frac{10}{11}$	$\frac{11}{12}$	$\frac{12}{1}$
L	l	L	l	L	l	L	l	L	l	L	l	L

The first of the above lines, marks the Intervals *major* and *minor*; the second, the letters or notes; the third, placed intermediary, show the intervals between the adjacent notes to be of three different values, viz. the *major* Semitone S, the *medius* Semitone S, and the *minor* Semitone s, the octave consisting of 7S + 3S + 2s; and wherein it is easy, to count up any other intervals in S, S and s (which may be called the *Chromatic Elements*); thus, 2S + S + s is the Major Third, and 4S + 2S + s the Fifth, &c. The fourth line shows the ratios of the above Intervals in this chromatic scale; and the fifth shows by the letters L and l, placed intermediary, the major and minor Limmas, of a regularly *tempered scale*; in which it will be perceived, that in three instances the l or flat is substituted for S, and in two instances for s. Though the five flats would seem to indicate D, as the

* For the convenience of printing, I have taken the liberty of substituting the old English capital (S) for the S with curved points for the Semitone medius = 47S + f + 4m in our 5th plate in vol. xxviii. and was so written in the copy; and the old English small (s) for the scrip capital S or the Semitone minor = 36S + f + 3m in the Table, and in the copy.—
EDITOR.

Key

Key major, in this case, yet it will appear, on counting up from D, that many of the intervals are false above that note, in this arrangement of the Douzeave.

Mr. Liston denominates that the *original Scale* (p. 28), which the twelve finger-keys give on his Organ, without the use of any pedal, viz.

I	II	3	III	4	IV	V	VI	7	VII	VIII		
C	C*	D	E ^b	E	F	F*	G	G*	A	B ^b	B	c
♯	S	S	♯	S	♯	S	♯	S	S	♯	S	
$\frac{1}{1}$	$\frac{1}{3}$	$\frac{2}{3}$	$\frac{2}{4}$	$\frac{3}{4}$	$\frac{3}{2}$	$\frac{3}{2}$	$\frac{4}{3}$	$\frac{5}{3}$	$\frac{5}{4}$	$\frac{6}{5}$	$\frac{7}{5}$	$\frac{7}{4}$
I	L	L	I	L	I	L	I	L	L	I	L	

Wherein, when compared with the last Scale, we have, instead of the minor Second in the first line, the redundant Unison; instead of the 5th we have the IV, and instead of the minor sixth the Redundant Fifth, or Diesis-defective minor Sixth. The second line shows, that three sharps and two flats occur in this original scale. The third shows the intervals between the several half notes, as they are vulgarly called, in Chromatic Elements, where 7S + 3♯ + 2♭ = VIII, as before; the fourth shows the ratios; and the fifth, the order of the two tempered douzeave Elements L and I mentioned in the note p. 375, and where 7L + 5I = VIII, as before.

The following Tables, will show the consonances that can be taken *true*, in the *Douzeaves* last mentioned, either Perfect or Tempered, and the Wolves or false notes which *result*, for the want of additional notes, beyond the number 12.

A TABLE OF TRUE CONSONANCES.

Douzeave Consonances.	Perfect.	Regularly Tempered.	Douzeave Consonances.	Perfect.	Regularly Tempered.
{ *I	♯		I		
2	S	L	V	4S + 2♯ + ♯	4L + 3I
{ II	S + ♯		*V	4S + 2♯ + 2♯	4L + 4I
II	S + ♯	L + I	6	5S + 2♯ + ♯	5L + 3I
3	2S + ♯	2L + I	{ VI	5S + 2♯ + 2	5L + 4I
III	2S + ♯ + ♯	2L + 2I	7	6S + ♯ + 3♯	
4	3S + ♯ + ♯	3L + 2I	{ VII	6S + 2♯ + 2♯	6L + 4I
{ IV	3S + 2♯ + ♯	3L + 3I	8	7S + 2♯ + 2♯	7L + 4I
5	4S + ♯ + ♯	4L + 2I	VIII	7S + 3♯ + 2♯	7L + 5I

416 Scales of the Temple and Foundling-Hospital Organs.

A TABLE OF WOLVES, OR RESULTING TEMPERED CONSONANCES.

Douzeave Consonances.	Bass and Treble Notes.	Wolf Intervals.
2	CC*, EbE, FF*, GG*, and BbB	1
II	C* Eb, and G* Bb	2 L
3	Eb F*, FG*, and Bb c*	L + 2l
III	C* F, F* bb, G*c, and Beb	3 L + 1
4	Eb G*	2 L + 3l
{	5 CF*, DG*, EbA, FB, Gc*, and Beb	3 L + 3l
	IV C*G, EBb, F*c, G*d, Aeb, and Bf	4 L + 2l
V	G*eb	5 L + 2l
6	CG*, EbB, Fc*, and Bbf*	4 L + 4l
VI	C*Bb, F*eb, G*f	6 L + 3l
7	Ebc*, and Bbg*	5 L + 5l
VII	C*c, Eeb, F*f, G*g, and Bbb	7 L + 4l

In the above Tables, where two consonances are linked together, only one of these can be tuned or taken on a douzeave Instrument, and they are only inserted here, for explaining the effects of different modes of tuning these notes, which so frequently require to be changed, in the taking of chords and in modulating. The 2nds in the first line in the last Table, are not in reality Wolves, because 1 is the proper value of a sharp or a flat, in Tempered Systems, but are inserted to show, that they differ from L the minor Second.

The *Quatorzeave* Scale of 14 Notes, on the Inner *Temple Organ*, effected by two divided finger-keys, is as follows; viz.

C C* D $\widehat{D^*Eb}$ E F F* G $\widehat{G^*Ab}$ A Bb B c
 \mathfrak{S} S \mathfrak{S}^\dagger ϵ \mathfrak{S} \mathfrak{S} S \mathfrak{S} \mathfrak{S} ϵ \mathfrak{S} \mathfrak{S} S
 l L l d l L l L l L l d l L l L

Here the Octave in perfect Intervals, consists of 5S + 3 \mathfrak{S} + 4 \mathfrak{S} + 2 ϵ , as in the second line, and since $\mathfrak{S} + \epsilon = S$, this is equivalent to 7S + 3 \mathfrak{S} + 2 \mathfrak{S} , as in the douzeave scale above. In the third line the elements of a regularly Tempered Scale on this Instrument are shown, the octave consisting of 5L + 7l + 2d; and since the minor Limma

† I am sorry to be obliged to substitute the small Greek epsilon (ϵ) for the scrip capital E, used for the Enharmonic *Diesis* 21 \mathfrak{S} + 2m in the Table, Plate V in vol. xxviii. and in the copy.—EDIT.

and Diesis make the major Limma in all such scales, or $l+d=L$; we have $7L+5l=VIII$, as in the douzeave above.

The *Siezave* Scale of 16 Notes, on the *Foundling Hospital Organ*, effected by moving a stop sideways by the hand, is as follows; viz.

C C*Db D D*Eb E FF*G G*Ab A A*Bb B c
 S E S s e s S S s e s S E S S
 l d l l d l L l L l d l l d l L

Here the Octave in perfect Intervals, consists of $4S + 4\bar{s} + 4\bar{s} + 2e + 2E$; and since $S + E = S$ and $s + e = S$, this equation reduces to $7S + 3\bar{s} + 2\bar{s}$, as before. The regularly Tempered Octave in this case, consists of $3L + 9l + 4d$; and since $l + d = L$, this becomes $7L + 5l = VIII$, as above.

The *Dixseptave* Scale of 17 Notes†, on the *Christchurch Organ*, in Surry Road, erected by Mr. Thomas Elliot, in May, 1812, under Mr. Hawke's Patent, effected by two Pedals; or, on the Piano Fortes now exhibiting by Mr. Bill, at No. 75, in Newman-street, is as follows, viz.

C C*Db D D*Eb E F F*Gb G G*Ab A A*Bb B c
 S E S s e s S S E S s e s S E S S
 l d l l d l L l d l l d l l d l L

Here the Octave in perfect Intervals, consists of $2S + 6\bar{s} + 4\bar{s} + 2e + 3E$; and which, since $3S = 3\bar{s} + 3E$, and $2S = 2\bar{s} + 2e$, becomes $7S + 3\bar{s} + 2\bar{s}$, as before. The regularly Tempered Intervals here are, $2L + 10l + 5d$ in the Octave; which, since $5L = 5l + 5d$, becomes $7L + 5l$ as before.

The *Dixneufave* Scale of 19 Notes, on an Organ which Mr. Russell senior, made about the year 1780 (see Dr. Kemp's Musical Magazine, vol. i. p. 170 and 188, and Mr. J. Marsh's Theory of Harmonics, p. 18), is as follows, viz.

C C*Db D D*Eb E E*F F*Gb G G*Ab A A*Bb Bcb c
 S E S s e s S E S s e s S E S S
 l d l l d l l d l d l l d l l d l d l

Here $8\bar{s} + 4\bar{s} + 2e + 5E = VIII$; and since $5S = 5\bar{s} + 5E$, and $2S = 2\bar{s} + 2e$, we have $7S + 3\bar{s} + 2\bar{s}$, as before. Also $12l + 7d = VIII$, and since $7L = 7l + 7d$, we have $7L + 5l$, as before.

† Mr. Kirkman is said to have made Instruments with 17 notes, before the year 1790, see Dr. Kemp's Musical Magazine, vol. i. p. 134; and the late Mr. Charles Clagget also did the same.

$$\begin{array}{cccccc} \widehat{G^* Ab} & \widehat{A Bbb} & \widehat{A^* Bb} & \widehat{B cb} & \widehat{B^* c} & \\ \varepsilon & \delta & \varepsilon & \delta & \varepsilon & \delta & \varepsilon \\ d & l & d & n & d & l & d & n & d \end{array}$$

Here $3\mathfrak{S} + 4\mathfrak{S} + 5\delta + 7\varepsilon + 5\mathfrak{E} = \text{VIII}$, and since $2S = 2\mathfrak{S} + 2\varepsilon$, and $5S = 5\delta + 5\varepsilon + 5\mathfrak{E}$, we have $7S + 3\mathfrak{S} + 2\mathfrak{S} = \text{VIII}$, as before. Also, $7l + 12d + 5n = \text{VIII}$, and since $2L = 2l + 2d$, and $5L = 10d + 5n$, we have $7L + 5l = \text{VIII}$, as before.

The *Cinquanteneufave* Scale of 59 Notes, on the Patent *Euharmonic Organ* invented by the Rev. Henry Liston, in 1810, and made by Messrs. Flight and Robson, in 1812, now exhibiting at their house, No. 101, in St. Martin's Lane, effected by 11 Pedals, is as follows, viz.

$$\left\{ \begin{array}{l} C \ C' \ C^* \ C^* \ Db \ C^* \ D'b \ C^{**} \ D' \ C'^{*} \ D \ D' \\ c \ l \ c \ \mathfrak{E} \ \Sigma \ \mathfrak{E} \ \pi \ \mathfrak{E} \ \Sigma \ \mathfrak{E} \ c \ l \\ 0 \ 11 \ 36 \ 47 \ 57 \ 58 \ 68 \ 83 \ 93 \ 94 \ 104 \ 115 \end{array} \right.$$

$$\left\{ \begin{array}{l} D^* \ E'b \ D^* \ E'b \ E'b \ E \ F'b \ E' \ Fb \ F'b \ E^* \\ \mathfrak{E} \ \Sigma \ \mathfrak{E} \ c \ l \ \mathfrak{E} \ \Sigma \ \mathfrak{E} \ c \ l \dagger \ c \\ 140 \ 150 \ 151 \ 161 \ 172 \ 197 \ 207 \ 208 \ 218 \ 229 \ 233 \end{array} \right.$$

$$\left\{ \begin{array}{l} E^* \ F \ E^* \ F' \ F^* \ F^* \ Gb \ F^* \ G'b \ F^{**} \\ \mathfrak{E} \ \Sigma \ \mathfrak{E} \ l \ c \ \mathfrak{E} \ \Sigma \ \mathfrak{E} \ \pi \ \mathfrak{E} \\ 244 \ 254 \ 255 \ 265 \ 290 \ 301 \ 311 \ 312 \ 322 \ 337 \end{array} \right.$$

$$\left\{ \begin{array}{l} G' \ F'^{*} \ G \ G' \ G^* \ A'b \ G^* \ Ab \ A'b \ A \\ \Sigma \ \mathfrak{E} \ c \ l \ \mathfrak{E} \ \Sigma \ \mathfrak{E} \ c \ l \ c \\ 347 \ 348 \ 358 \ 369 \ 394 \ 404 \ 405 \ 415 \ 426 \ 451 \end{array} \right.$$

$$\left\{ \begin{array}{l} A' \ Bbb \ B'bb \ A^* \ A^* \ Bb \ A^* \ B^* \ B' \ B \\ \mathfrak{E} \ c \ l \ c \ \mathfrak{E} \ \Sigma \ \mathfrak{E} \ l \ c \ \mathfrak{E} \\ 462 \ 472 \ 483 \ 487 \ 498 \ 508 \ 509 \ 519 \ 544 \ 555 \end{array} \right.$$

$$\left\{ \begin{array}{l} Cb \ B' \ Cb \ B^* \ c' \ B'^* \ c \\ \Sigma \ \mathfrak{E} \ \pi \ \mathfrak{E} \ \Sigma \ \mathfrak{E} \end{array} \right\}.$$

Here $7l + 3\pi + 13c + 23\mathfrak{E} + 2l + 11\Sigma = \text{VIII}$, and because $5l + 6\mathfrak{E} + 11\Sigma = 3\pi + 13c + 2l$, the above equation becomes $12l + 29\mathfrak{E} + 22\Sigma$, as in the Table of Intervals at page 276 of vol. xxxvii; and also, since $7S = 7l + 21\mathfrak{E} + 14\Sigma$, $3\mathfrak{S} = 3\pi + 9c - 3\Sigma$, and $2\mathfrak{S} = 4c + 2\mathfrak{E} + 2l$, we have $7S + 3\mathfrak{S} + 2\mathfrak{S} = \text{VIII}$, as above. In the third line, the number of schismas or Σ s, answering (in my Notation) to each of Mr. Liston's Notes, are given; these, by some

† I am obliged to substitute the old English small c (τ) for the \mathfrak{c} with a dash across them, used for the semi-comma major $4\Sigma + \mathfrak{f}$ in vol. xxviii. Plate V, and in the copy.—EDITOR.

have

have been called my *Artificial Commas*, in imitation of Mercator's artificial commas 53 in the Octave, (Holder's Treatise, 1st Edit. p. 79), the reason or derivation of whose curious approximate common-measure to Intervals, was unknown, I believe, until I had expressed and arranged Intervals in the notation by Σ , f and m , when the number of m s to any note in such new Notation, was found to agree exactly with Mercator's numbers. With respect to these and all other *artificial commas*, it is to be observed, that they form a sort of musical (whole number) logarithms, having the least Interval as their *unit*, and will, by addition and subtraction, correctly show the values and relations of intervals *larger than their unit, and between which no differences occur smaller than their unit*; all smaller intervals, and some of those very near to the value of the unit, are however erroneously expressed by them: but in perfect Harmony, as I have before observed (vol. xxxvii. p. 274), no less Interval than Σ occurs, and therefore they may be safely used, in all its calculations.

In the Table which I gave in vol. xxxvii. p. 276, of the Notes on Mr. Liston's former Instrument, nine of the above notes are omitted, viz.

	f	e	Σ		f	e	Σ	
B'bb	9	24	18		Fb	4	11	8
Bbb	9	23	17		F'b	4	10	7
F**	7	16	13		C'**	2	4	4
F**	7	15	12		C**	2	2	2
F'b	4	12	9					

And the 10 following were inserted unnecessarily in that Table, on account of there being no shades to produce these notes, as being found unnecessary in the widest range of modulation; viz. B*, C'b, B'b, A', G*, G'b, F', E', D* and D'b, by which the scale for the new Organ is reduced to 59 Notes, as above.

The shades by which the alteration of a comma is produced in the sounds of the Pipes, as explained in vol. xxxvii. p. 328, and in Mr. Liston's Essay, p. 45, not being able to *raise* their sounds, only to depress their pitch, one, or two commas, the Pipes in Mr. L.'s Organ, are necessarily tuned to the acute notes; a standard Pipe, a major comma higher than Concert Pitch, being used for pitching C' †, from whence the Tuning is conducted *upwards*, thus, viz.

† Or, having the pitch of C, we may tune upwards C \vee G \vee D \vee A' \vee E', and then downwards F III C' which is the proper pitch for commencing Tuning, as Mr. L. shows, p. 44.

On the Scale and tuning of the Rev. Mr. Liston's Organ. 421

C' √ G' √ D': then C' III E' √ B' √ F'* √ C'*, and
E' 4th A'; then E' III G'* √ D'* √ A'* √ E'*; then
G'* III B'* √ F'*** √ C'***.

Then *downwards* C' √ F' √ B'b; then C' III A'b 4th
E'b: then A'b √ D'b √ G'b √ C'b; and then A'b III
F'b √ B'bb; which completes the Tuning of *the Pipes*.

Three Fifths are then tuned *downwards* by help of the
one-comma shades to obtain C, viz. A' √ D' √ G' √ C'.
Then C III E' √ B' √ F*, &c. just as above, except being
a comma lower, or without acute accents.

In like manner three other Fifths are tuned *downwards*,
by means of the two-comma shades, to obtain C',
viz. A √ D' √ G' √ C'. Then *upwards* G' III B'; then
D' III F'* III A'*: and then A III C'* III E'*. Then
downwards C' III A'b; then G' III E'b; and then
Cb √ F'b. Which completes the tuning of the 59 Notes
of this *Grand harmonic Scale*; at the multiplicity of whose
Notes, the intelligent student need not be at all alarmed,
since the excellent contrivance of Mr. Liston's Organ, en-
ables the whole to come into play when wanted, through
the means of the 12 ordinary finger-keys, and a pedal to be
pressed now and then, when the key changes, so as to re-
quire the use of notes beyond those twelve that are in the
scale at the time; and at others, when certain notes require
altering a comma to perfect the harmony, all of which are
marked in numerous examples and pieces of music, in Mr.
Liston's Book, and in other printed Music that he has ready
provided, for those Professors or Amateurs who may honour
him by a trial of his Instruments, at Messrs. Flight and
Robson's.

The commendable disposition shown by the people of
this metropolis, for encouraging an extension and improve-
ment of the Musical Scale of *Keyed Instruments* (for with
Voices and Violins, &c. Mr. Liston's scale always has and
always will be *in use*), in the instances that I have men-
tioned above, seems in a particular manner to have alarmed
the German Organist Mr. Kollmann, for the fate of his
modern

422 *Kollmann's Opposition to all the preceding Improvements.*

modern "scale of nature," or 12 sounds only in the Octave, placed at equal distances, on which his "new Theory" appears entirely built, that he so pompously and incessantly compares with the best writings of British Musicians, to their disadvantage, in his Quarterly Review; which "wonderful compound of twelve Diatonic Chromatic Enharmonic Scales in one!" it is admitted by Mr. K. must be abolished, as the first consequence of the establishment of the "artificial Temperaments" of Hawkes, Loeschman, and Liston!, and therefore, he takes especial pains to cry them all down as useless and absurd.

What a lamentable case! that the progress of Science and Improvement in one of the most delightful of arts, should render the sale less certain, of the voluminous works of this profound Theorist!, who, to the honour, or disgrace rather of the age, broadly asserts, that violins, violoncellos, and voices, *ought not to make any difference* between A \flat and G \sharp , D \flat and C \sharp , &c.!! but should use, "as nearly equal a temperament† as possible," or in other words, "follow the (his) true *standard scale*, on which all modern music depends." Not doubting but the scientific and demonstrable principles advanced in the "Essay on perfect Intonation," will make their way, confirmed as they are in every case, by an appeal to experiment, unimpeded by such antiquated and unphilosophical, not to say interested, opposition, as that I have been alluding to,

I remain, sir,

Your obliged and very humble servant,

12, Upper Crown-Street, Westminster,
June 4, 1812.

JOHN FARRY Sen.

P. S. In conversation a few days ago with Mr. Loesch-

† A Temperament as nearly equal as it is possible for the ear to judge of it, results from taking each Fifth a schisma flat, or making the same to consist of 2t + 3H, as first mentioned in your 28th volume, p. 65 (see also xxxvi. p. 48). Now, in Mr. Liston's Scale above described, there are 15 pairs of notes exactly at this distance apart, viz. C \sharp & A \flat , C \sharp & Ab, C $\sharp\sharp$ & A, D' & Bbb, D' \sharp & Bb, E' & Cb, E \sharp & c', E \sharp & c, F \sharp & db, F $\sharp\sharp$ & d', G' \sharp & e'b, A' & f'b, A' \sharp & f. B' & gb, and B' \sharp g'. And 15 pairs of equal temperament Fourths, the complements of the above, as A \flat & C \sharp , Ab & C \sharp , &c. whose value is 3T - H or 255 Σ + 5f + 22m.

Twenty-six major Thirds and as many minor Sixths are found in his scale that differ only 3 Σ from the equal Temperament, and 24 minor Thirds and as many major Sixths that differ only 2 Σ from these favourite chords of Mr. Kollmann, but no concords except I, VIII, V and 4, that exactly agree with that Scale. I am not aware, how far the construction of Mr. L.'s new Organ, admits of trying the notes together, of the above equal temperament Scale.

man,

man, he informed me, that he could introduce this extended scale of 59 Notes on a Grand Piano Forte; using inovable bridges, for producing the sharpening of one or of two commas, of an improved construction, that for such small alterations, would be free of the evils formerly produced by Mr. Clagget's movable bridges, for changing sharps to flats, &c.; but he has no inclination to embark in such a speculation, unless some Nobleman or Gentleman would order such an Instrument. Mr. Liston informs me, that this was one of the first applications of his principles, that occurred to him; but that on application to Mr. Stoddard, he dissuaded him from thinking of applying them, on any Instrument but the Organ.

LXII. *On Vegetable Wax, &c.* By R. MAC-CULLOCH, M.D. Woolwich. Communicated by the Author.

IT is now well known that wax is a vegetable product, as well as the result of an animal process in bees and other insects, and the wax of various plants has been successively examined by different chemists. Some slight differences have been observed in the several varieties, but they are not sufficient to lead us to consider them as different species; rather, like the generality of the resins, to be varieties of one common substance. To those already described there is still to be added one, which as far as I know has not yet been noticed. This is a substance held in solution in the essential oil of the rose (the attar of roses) and in that of lavender. I have not searched among the other oils, but it will probably be found in some of them. All the varieties of these two oils do not however contain it; it is frequently absent in the oil of lavender, although but rarely in that of the rose.

I am not acquainted with the circumstances under which this variation occurs. When these oils are cooled below a certain point, a portion of this matter is deposited in the form of minute crystals, giving them an appearance somewhat similar to that which the fixed oils assume on freezing. On the addition also of alcohol it is separated in the form of minute brilliant scales, and by this method I obtained the portion which I examined. It is equally separated by water, which, if enough be used, dissolves the whole of the oil, and leaves it in a pure state. It is thus that it is collected in the pipes of the stills in which rose-water is made, as it is volatilized in combination with the oil, and precipitated